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while for the advancement of knowledge. The actual workers therein should be full-time men. Whether the titular chief should always be such is an undecided question and is largely dependent upon the personal equation.

Such laboratories as these are the glory of the Harvard Medical School. To the young men who are to be the leaders of the future belongs the present opportunity. The lands of Europe are wasted and impoverished by war. Only the wounded and the physically unfit were allowed to study medicine in England last winter. The men of England and the men of France have fought for four long years; ours for four months. The young physicians of America of the present generation have the obligation and may, perhaps, deserve the credit of establishing in the days to come, the dreams for medicine of Magendie and of Claude Bernard, thus insuring a notable scientific era in this great land of ours. Only thus can medicine progress; only through observation and experiment can the world grow in wealth of knowledge. We may thus endeavor, "as Lord Bacon says, to frame the human understanding anew."

GRAHAM LUSK

#### THE SMITHSONIAN "SOLAR CONSTANT" EXPEDITION TO CALAMA, CHILE

In 1916 Secretary Walcott appropriated from the income of the Hodgkins Fund to equip and maintain for several years such a station in South America, but owing to the war it was temporarily located in the North Carolina mountains in 1917. The station proved very cloudy, and now it has proved possible though very expensive to go to Chile.

Dr. C. G. Abbott has reported to the National Academy of Sciences that after correspondence with the South African, Indian, Argentine and Chilean meteorological services he became convinced that near the nitrate desert of Chile is to be found the most cloudless region of the earth easily available. Dr. Walter Knoche, of Santiago, has most kindly furnished two years (1913 and 1914) of un-

published daily meteorological records for a number of Chilean stations. In his judgment the best station is Calama on the Loa River, Lat. S.  $22^{\circ} 28'$ , Long W.  $68^{\circ} 56'$ , altitude 2250 meters. For the two years the average number of wholly cloudless days is at 7 A.M., 228; 2 P.M., 206; 9 P.M., 299; and of wholly cloudy days, none. The precipitation is zero; wind seldom exceeds 3 on a scale of 12; temperature seldom falls below  $0^{\circ}$  or above  $25^{\circ}$  C.

The expedition, Director Alfred F. Moore, Assistant Leonard H. Abbot, reached Calama June 25, 1918, equipped with a full spectrophotometric, pyrheliometric and meteorological outfit of apparatus, as well as with books, tools, household supplies and everything foresight could furnish to make the work successful and life bearable. The Chilean government has facilitated the expedition in many ways, and the Chile Exploration Company has given the expedition quarters and observing station at an abandoned mine near Calama. Many others in Antofagasta, Chuquicamata and Calama have been of great assistance.

The apparatus is set up in an adobe building about 30 feet square, in which the observers have sleeping apartments. A 15-inch two-mirror coelostat reflects the solar beam to the slit of the spectro-bolometer. A Jena ultra-violet crown glass prism and speculum metal mirrors are used in the spectroscope. The linear bolometer is in vacuum, and constructed in accord with complete theory for greatest efficiency. Its indications as measured by a highly sensitive galvanometer are recorded photographically on a moving plate which travels proportionally to the movement of the spectrum over the bolometer. Successive bolometric energy spectrum curves each occupying 8 minutes of time are taken from early morning till the sun is high and are thus recorded on the plate. Their intensity indications at 40 spectrum positions are reduced by aid of a special slide rule plotting machine.

A pair of silver disk pyrheliometers is read simultaneously with each spectro-bolographic determination. Measurements of humidity, temperature, and barometric pressure accom-

pany the bolometric observations. Also a pyranometer is employed to determine the sky radiation.

The young men find pleasant companions at the great copper mine at Chuquicamata. At present they are boarding with a Chilean family at Calama, but as both are good cooks they may wish to board themselves. The railway and the river both pass the town of Calama, so that there is no such desert isolation as might be feared. To the east are the Andes Mountains. The peaks in that neighborhood rise to 16,000 or 17,000 feet. Some are volcanic but none of these are very near.

It is hoped that the work will be continued for several years at least, and that nearly daily observations may be obtained. The application of the results to meteorology is something which may prove to have great possibilities. To exploit them a long and nearly unbroken series of solar radiation observations must be obtained.

Observations were begun on July 27, under exceptionally favorable conditions of the experimental equipment. At latest report, on October 22, complete solar constant determinations had been made on five days in July, twenty-seven days in August, eighteen days in September and nineteen days in October, a total of sixty-nine days out of eighty-eight days elapsed.

Owing to the great zeal and industry of the observers and the excellent special computing facilities at their disposal, all of the observations had been completely worked up to date. If necessary for meteorological purposes it would be possible for them to telegraph the solar constant value on the same day observed.

Notwithstanding the high percentage of cloudless days, the sky conditions have not proved quite as satisfactory as had been hoped, owing to the presence of considerable haze and the occasional formation of cirrus clouds. While these modifications of transparency are not serious enough to introduce large errors in the results (all values have fallen between 1.88 and 2.02 calories) they are serious obstacles to the investigation of variations of the sun which should be measured to one per

cent. of the solar constant or better. Efforts are now being made with good prospect of success to devise an instantaneous method of determining the sky transparency so as to avoid error from changes of transparency occurring progressively during several hours.

The average value of the solar constant as thus far obtained at Calama is 1.951 calories per square centimeter per minute. The mean of all values obtained prior to 1914 was 1.932. At present the solar activity as measured by sun-spots is still large, though declining. In view of the past measurements of the solar constant and past investigations of the meteorological phenomena of the world it is to be expected that somewhat lower values of the solar constant and somewhat more cloudless observing conditions will be found at Calama after a year or two.

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## THE HARVARD ENGINEERING SCHOOL

FOLLOWING the decision of the Supreme Court of Massachusetts that the agreement with the Institute of Technology is not in accord with the will of the late Gordon McKay, Harvard has reorganized its engineering school on a basis satisfactory both to the trustees of the McKay estate and to the governing boards of the university. The new plan, however, will be subject to the approval of the Court. The full text of the vote passed by the Harvard Corporation and consented to by the Board of Overseers establishing the school follows:

Voted to establish a School of Engineering upon the following basis:

WHEREAS, in reconstructing an engineering school in Harvard University it is important to lay stress upon fundamental principles; to make use of the courses in Harvard College so far as is consistent with the curriculum of the school; and to conduct the school under a faculty of its own the corporation hereby adopts the following plan of organization:

1. Name. The name of the school shall be the Harvard Engineering School.

2. Departments. The school shall provide "all grades of instruction from the lowest to the highest" and the instruction provided shall "be kept